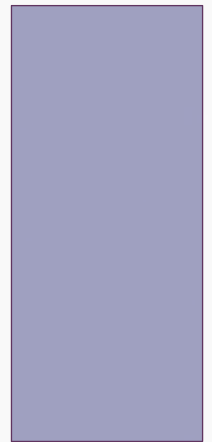


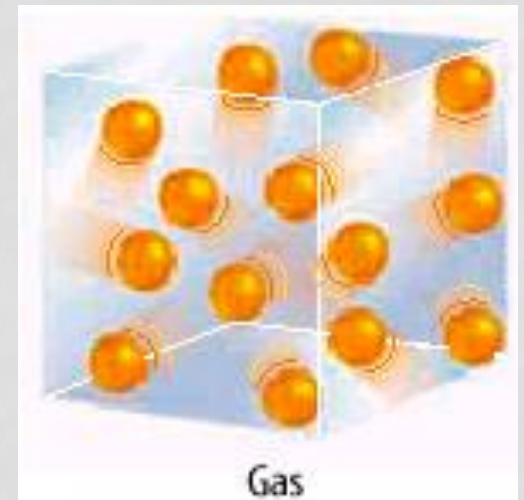
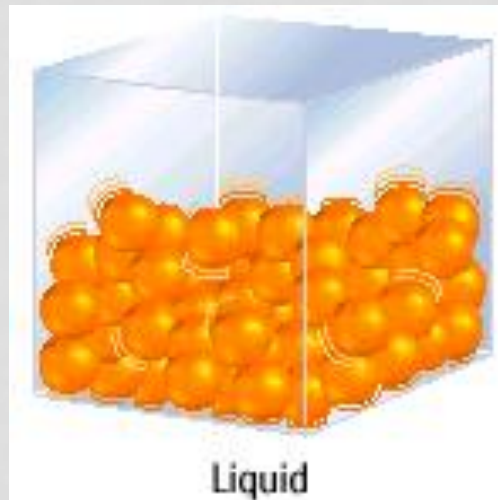
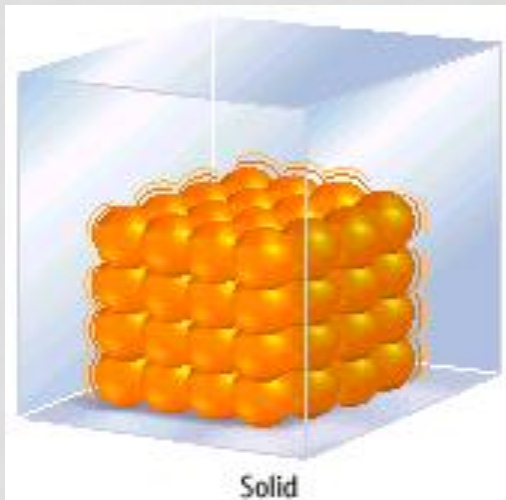
# BASIC IDEAS

## CHAPTER 2



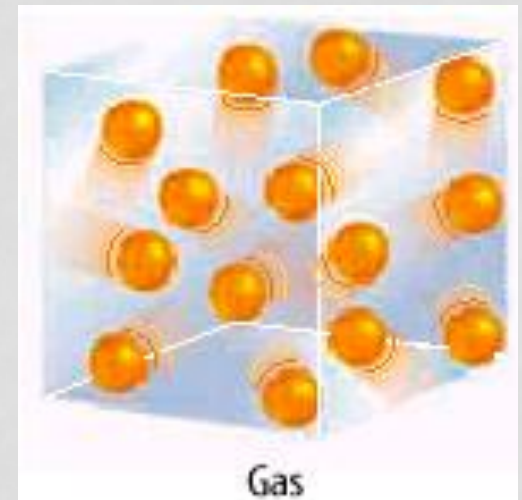
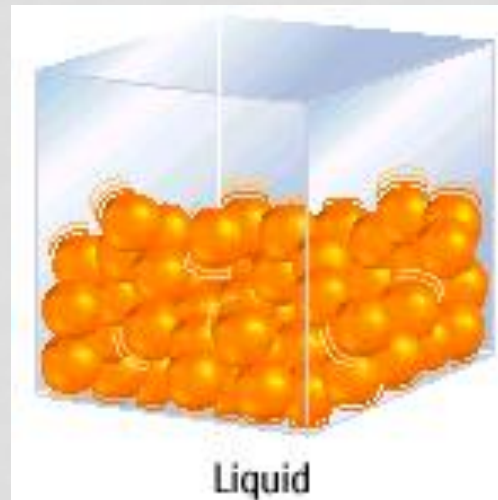
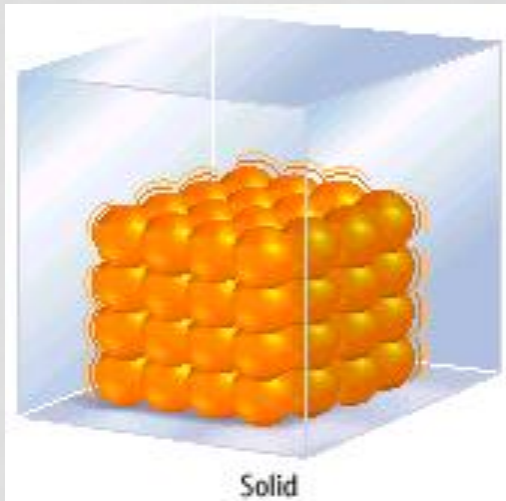
# THE KINETIC THEORY

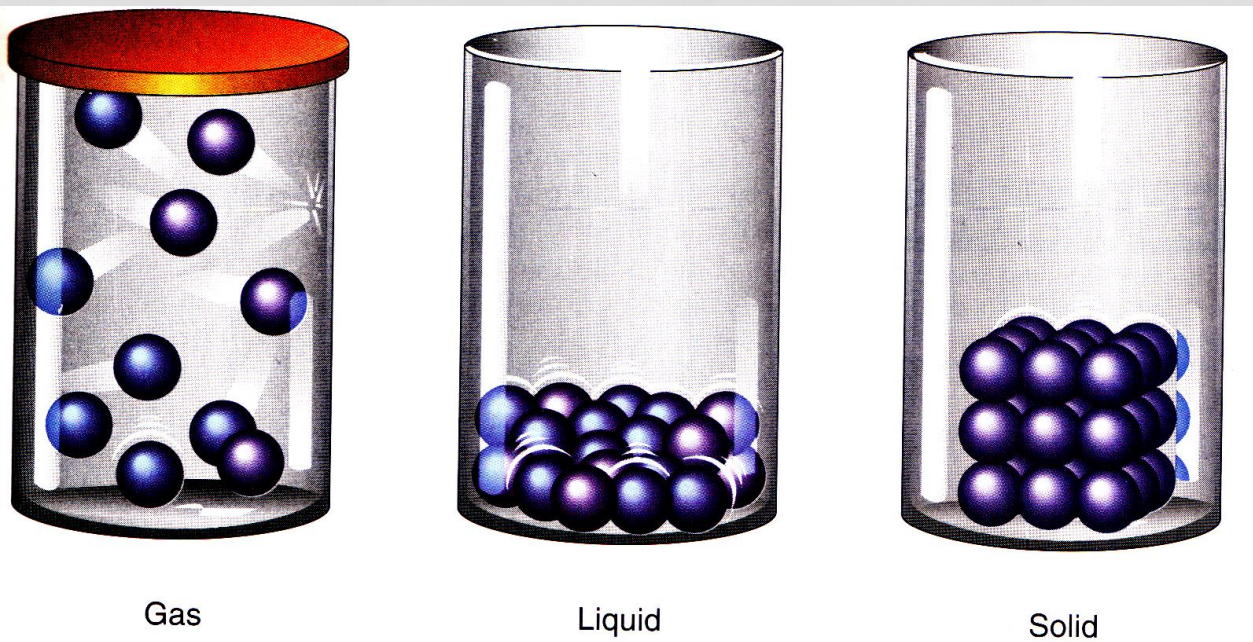
- 1. All matter is composed of small particles (atoms, molecules, or ions).
- 2. They are in constant, random motion.
- 3. They constantly collide with each other and with the walls of their container.



# THE KINETIC THEORY

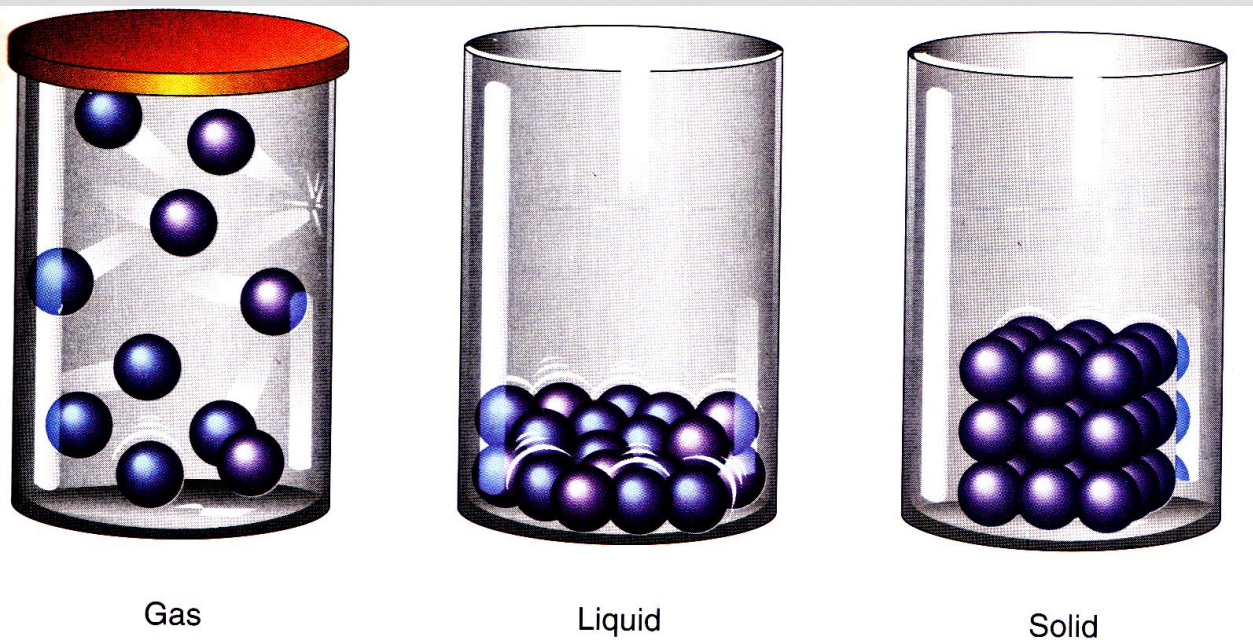
- Describe the particles in each state.





Particle Properties				
Phase	Proximity	Energy	Volume	Shape
Solid				
Liquid				
Gas				





Particle Properties				
Phase	Proximity	Energy	Volume	Shape
Solid	close	little	definite	definite
Liquid	close	moderate	definite	indefinite
Gas	far apart	a lot	indefinite	indefinite

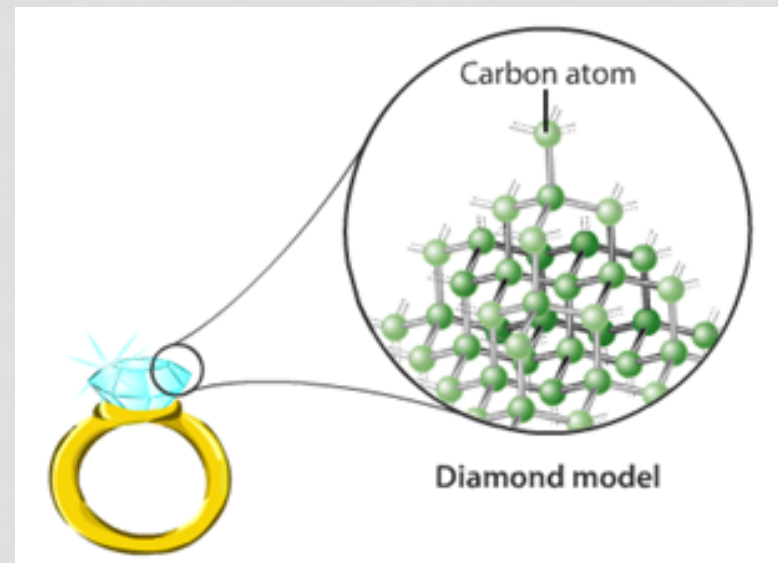
# DIFFUSION

- The movement of particles from a region of high concentration to low concentration down a concentration gradient.
- The result of diffusion is a gradual mixing of material by random molecular motion.



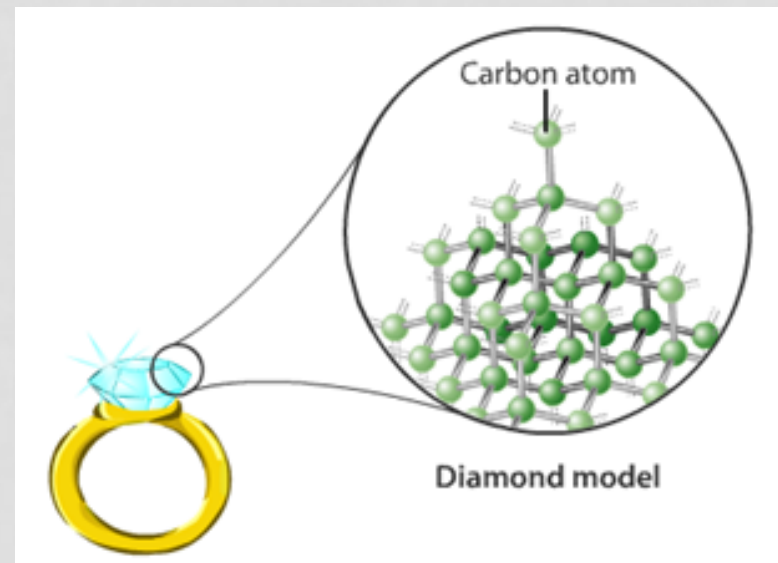
# ATOMS

- **Element** a substance that cannot be separated or broken down into simpler substances by chemical means.
- They are all made by the same atom
- Atoms are the basic units of matter.
- **Atom:** the smallest unit of an element that maintains the properties of that element.



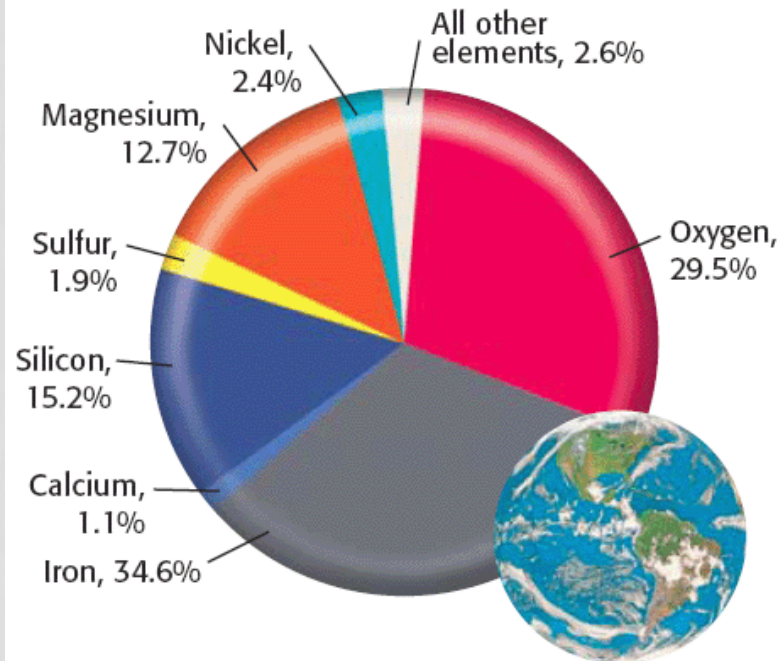
# ATOMS

- Each atom known has a name and chemical symbol present in the periodic table
- Who found this out about atoms? Dalton
- Song??



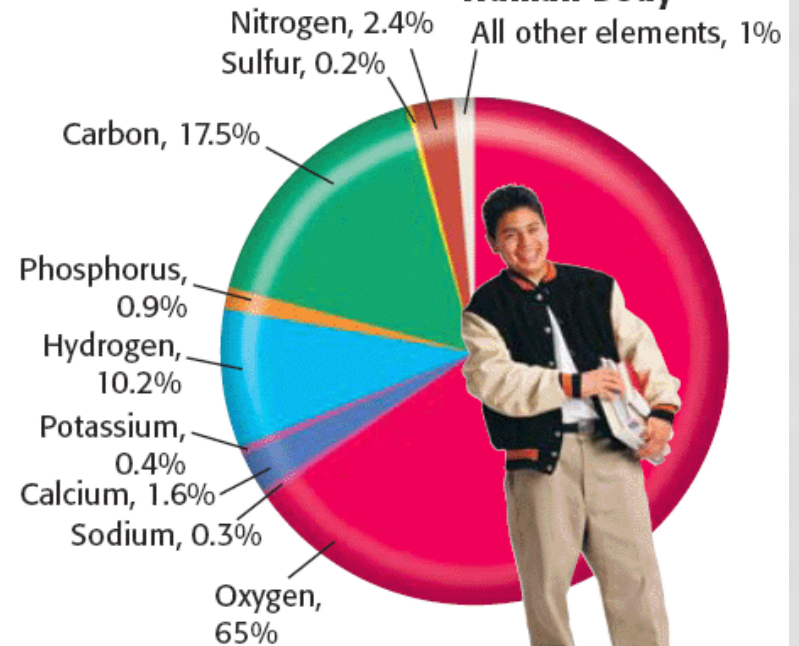
# ELEMENTS

## Earth



Tom Van Sant/The Geosphere Project/Corbis Stock Market

## Human body



Elements do not total 100% due to rounding.

Image Copyright ©2004 Photodisc, Inc.



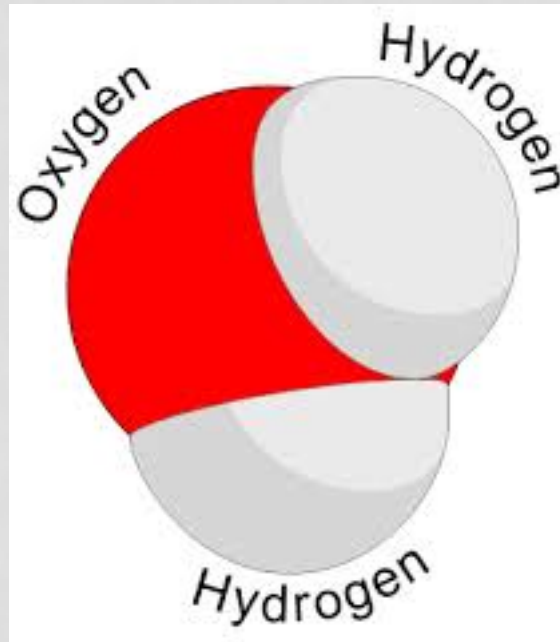
# SYMBOLS

- 1. Complete the right column of the table, using the following names: boron, bromine, calcium, magnesium, neon, nitrogen, silicon, sulfur, zinc.

Symbol	Element	Symbol	Element
O	oxygen	Mg	a.
H	hydrogen	Br	b.
Na	sodium	N	c.
K	potassium	S	d.
I	iodine	Ca	e.
C	carbon	B	f.
Cl	chlorine	Zn	g.
Fe	iron	Si	h.
Ag	silver	Ne	i.

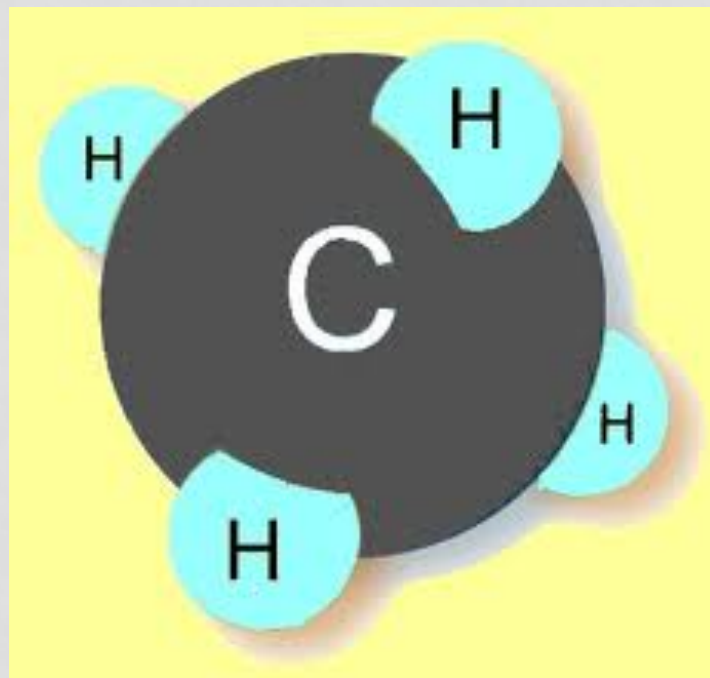
# CHEMICAL FORMULA

- Tells you what atoms in a molecule.
- Example: water ,  $\text{H}_2\text{O}$  what atoms does it have?



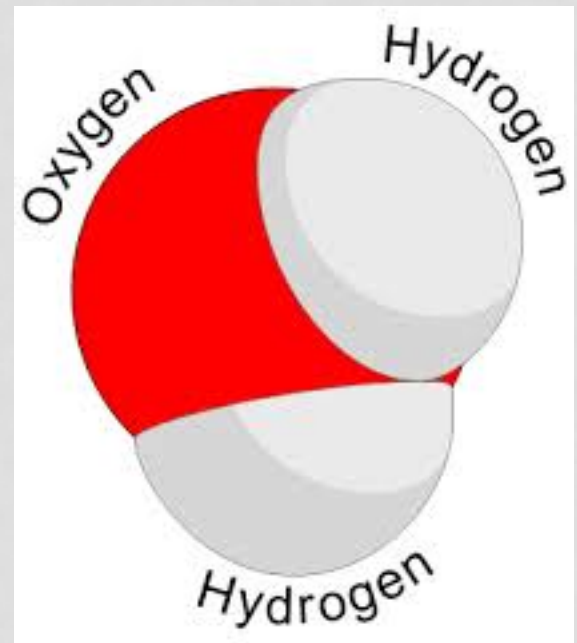
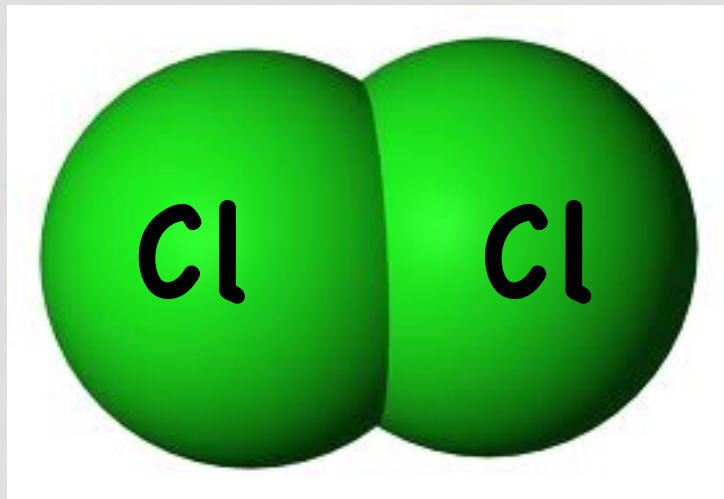
# COMPOUNDS

- Elements combine chemically to form a compound.
- Compound a substance made of atoms of TWO or more different elements that are chemically combined
- Which elements is this compound made from?



# MOLECULES

- **Molecules** are TWO or more atoms that are bonded chemically together



# QUESTION

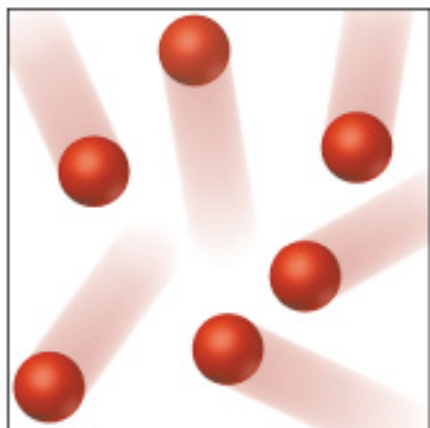
- So what's the difference between molecules and compounds?



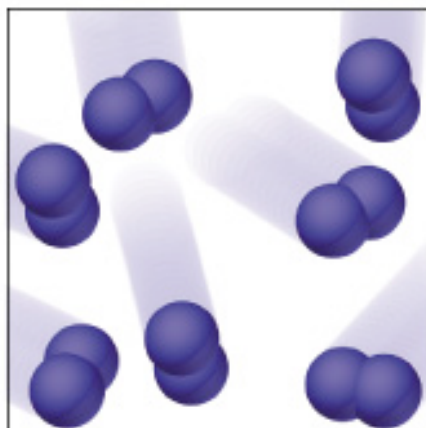
# QUESTION

- So what's the difference between molecules and compounds?
  - Compounds have to be made from different elements
- Complete the sentence by using the words molecules and compounds
  - All \_\_\_\_\_ are \_\_\_\_\_ but not all \_\_\_\_\_ are \_\_\_\_\_.

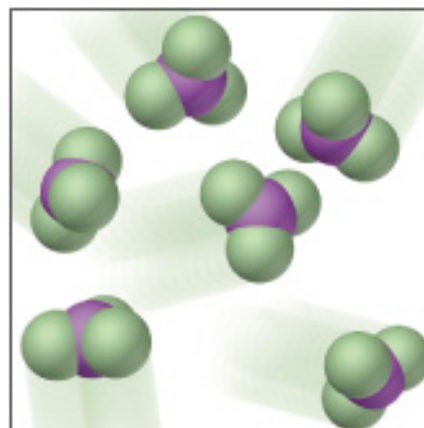
# SUMMARY



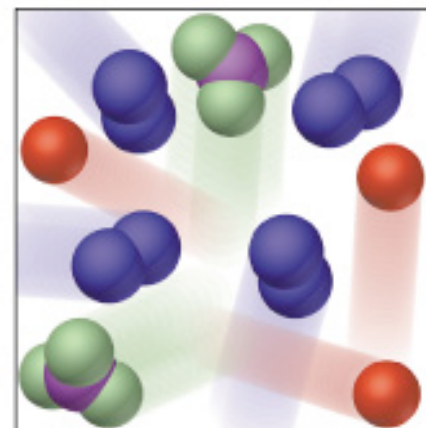
(a) Atoms of an element



(b) Molecules of an element



(c) Molecules of a compound



(d) Mixture of elements and a compound

# MIXTURES

- Mixtures are formed by mixing pure substances.
- Pure substance a sample of matter, either a single element or a single compound, that has definite chemical and physical properties
- Mixture a combination of two or more substances that are not chemically combined

# TYPES OF MIXTURES

## Homogeneous mixture

substances are evenly distributed, and the mixture is the same throughout



Fizzy drinks



salt/sugar solutions



cookies

## Heterogeneous mixture

substances aren't mixed uniformly and are not evenly distributed



salad

# SEPARATING MIXTURES

## Filtration

separate an insoluble solid from a liquid or solution



## Evaporation

separate an soluble solid from a liquid or solution



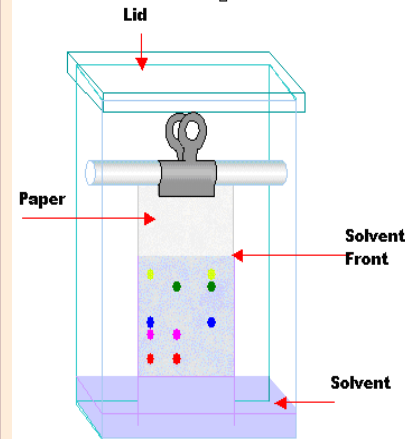
## Distillation

Simple: separate liquids with high boiling point difference OR separate liquids from involatile solids

Fractional:  
Separating two liquids with close boiling points.

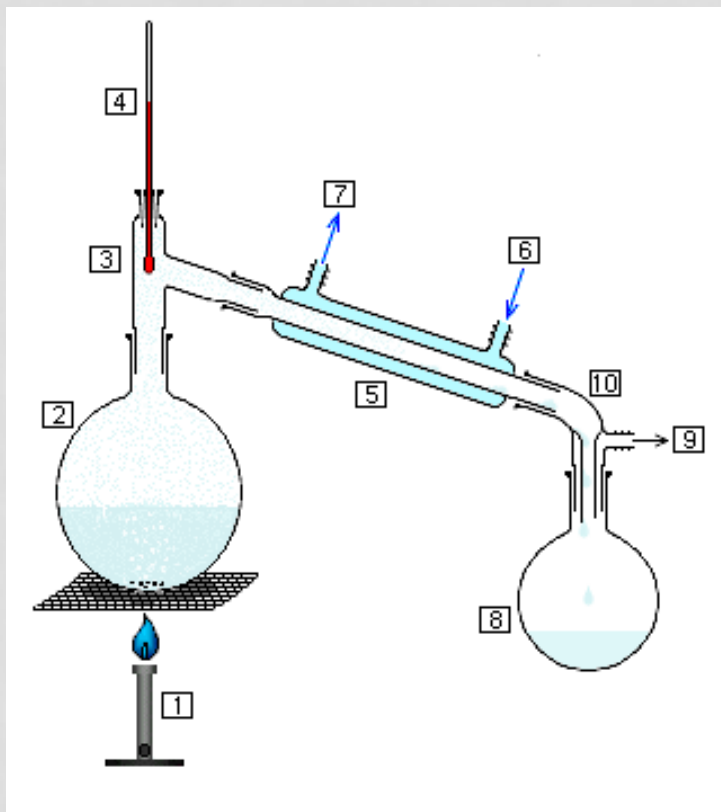
## Chromatography

separate a small amount of solid from a liquid or solution

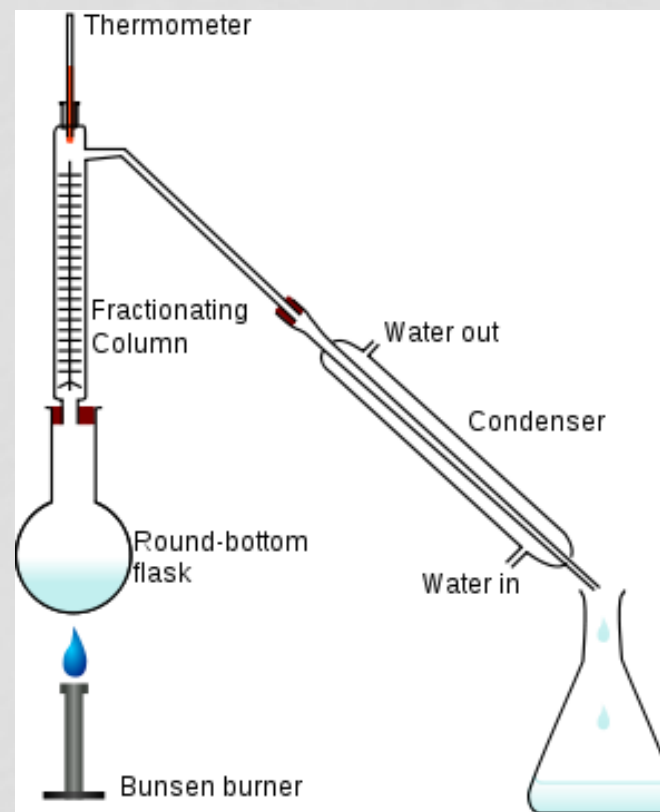




# SEPARATING MIXTURES



Simple distillation



fractional distillation

# Matter

## Pure Substances

## Mixtures

### Compounds

### Elements

### Heterogeneous mixtures

### Homogeneous mixtures

glucose, water,  
carbon dioxide

Ag, Au, O, H, C,  
Mg, Al, Fe, He

granite, pickle  
relish, noodle  
soup

seawater, air,  
bronze, brass

can not be separated by  
physical means

Can be separated by  
physical means

can be broken down by  
ordinary chemical  
means

Can not be broken down  
by ordinary chemical  
means

non-uniform  
composition

Uniform composition

examples

examples

examples

examples

# MATTER VS NON-MATTER

- What is matter?
  - is anything that has mass and takes up space (volume)
  - Mass: is the amount of matter in an object
  - Examples: table, book, tv, human, animal....
- Non-matter?
  - Anything that doesn't take up space or has mass.
  - Examples: energy(heat sound...), radio waves, feelings,

# PHYSICAL VS CHEMICAL PROPERTIES

- Physical properties: Properties that do not change the chemical nature of matter
- Chemical properties: Properties that do change the chemical nature of matter

# PHYSICAL VS CHEMICAL PROPERTIES

malleable

conductivity

react

burns

Physical state

density

Tarnish

Hardness

odor

explode

color

Melting point

ductile

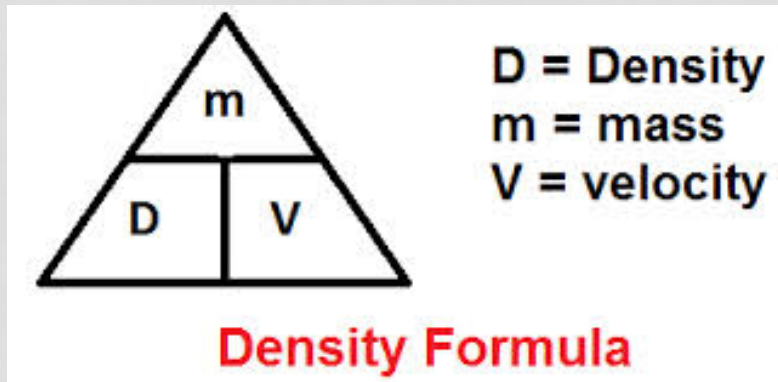
corrode

Physical property	Chemical property



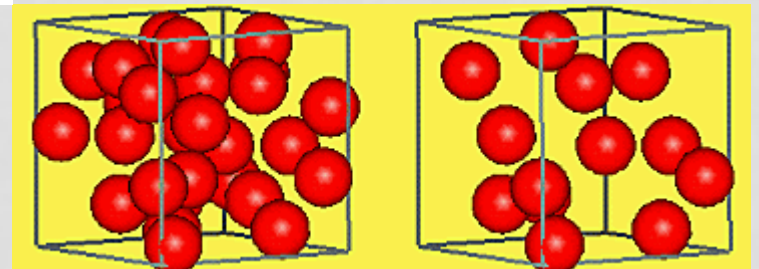
# DENSITY

- Which is heavier, iron or wood?
- It depends, an iron nail is lighter than a tree.
- Iron and wood have different densities.
- Density is defined as the mass per unit volume.



$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

- Which has a higher density?



# DENSITY

- If the mass is in kg (kilogram) and the volume in  $\text{m}^3$  (cubic meter), the density is measured in  $\text{kg}/\text{m}^3$  (kilogram per cubic meter).
- If the mass is in g (grams) and the volume in  $\text{cm}^3$  (cubic centimeter), the density is measured in  $\text{g}/\text{cm}^3$  (gram per cubic centimeter).

# DENSITIES OF DIFFERENT SUBSTANCES

◦ **TABLE 1 - *Densities of Common Substances***

Substance	Density (g/cm <sup>3</sup> )	Substance	Density (g/cm <sup>3</sup> )
Helium (gas)	0.0001663	Zinc (solid)	7.13
Oxygen (gas)	0.001331	Silver (solid)	10.50
Water (liquid)	1.00	Lead (solid)	11.35
Pyrite (solid)	5.02	Mercury (liquid)	13.55

# EXAMPLE

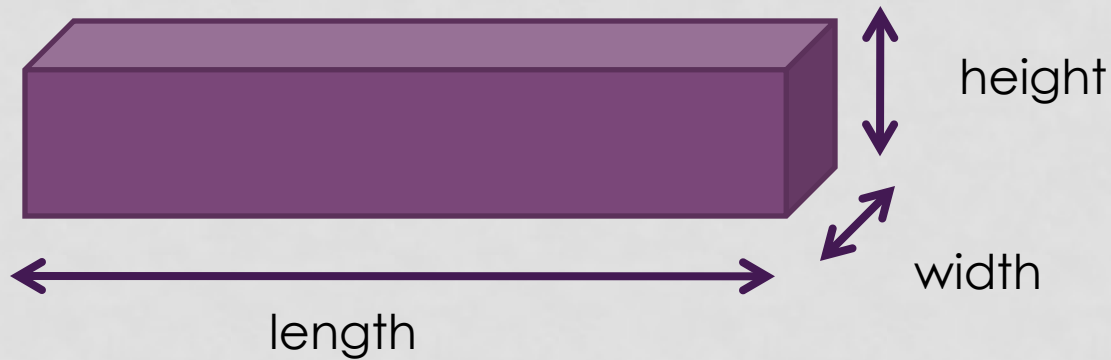
- An aluminium cylinder has a volume of  $250\text{cm}^3$  and a mass of  $675\text{g}$ . Calculate the density of aluminium.
- Calculate the volume of a gold ring of mass  $84\text{g}$ .  
Density of gold =  $19.3\text{ g/cm}^3$

# EXAMPLE

- An aluminium cylinder has a volume of  $250\text{cm}^3$  and a mass of  $675\text{g}$ . Calculate the density of aluminium.
  - $2.7\text{ g/cm}^3$
- Calculate the volume of a gold ring of mass  $84\text{g}$ .  
Density of gold =  $19.3\text{ g/cm}^3$ 
  - $4.35\text{ cm}^3$

# VOLUME

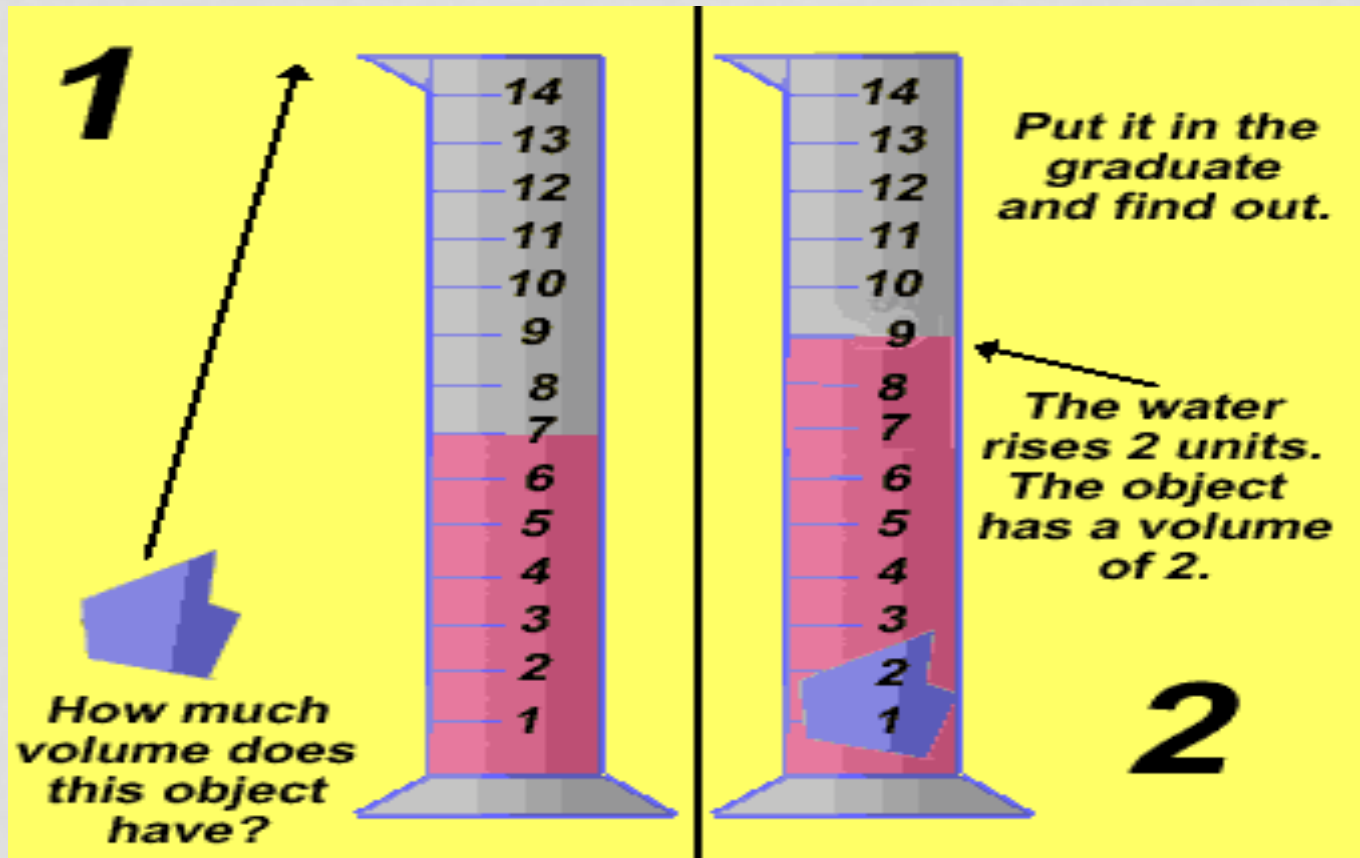
- Regular object:
- $\text{Volume} = \text{length} \times \text{width} \times \text{height}$





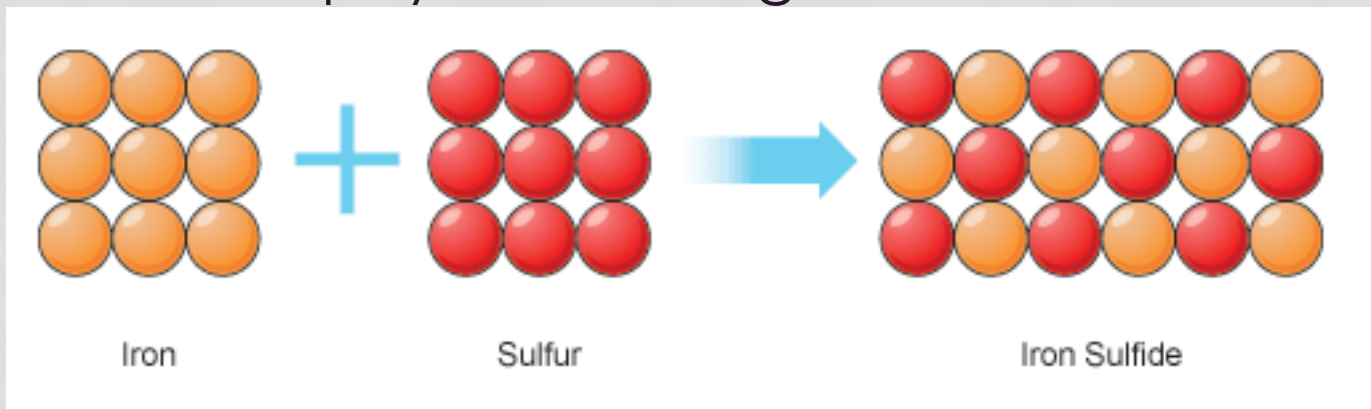
# VOLUME

- Irregular object: ( $1\text{ ml} = 1\text{ cm}^3$ )



# CHEMICAL EQUATIONS

- Iron + sulfur  $\rightarrow$  iron sulfide (word equation)
- $\text{Fe} + \text{S} \rightarrow \text{FeS}$  (symbol equation)
- Where are the reactant and where are the products?
- Describe the reaction? How many atoms of each reactant and product do you have?
- Chemical or physical change?

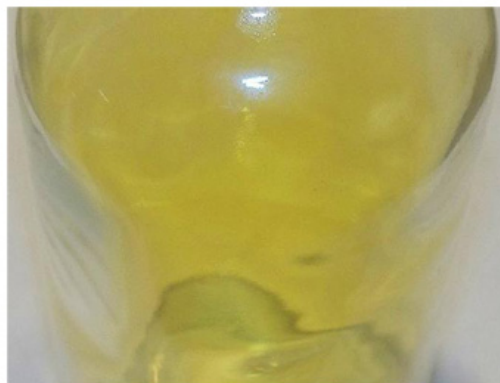


# CHEMICAL EQUATIONS



sodium metal

+



chlorine gas

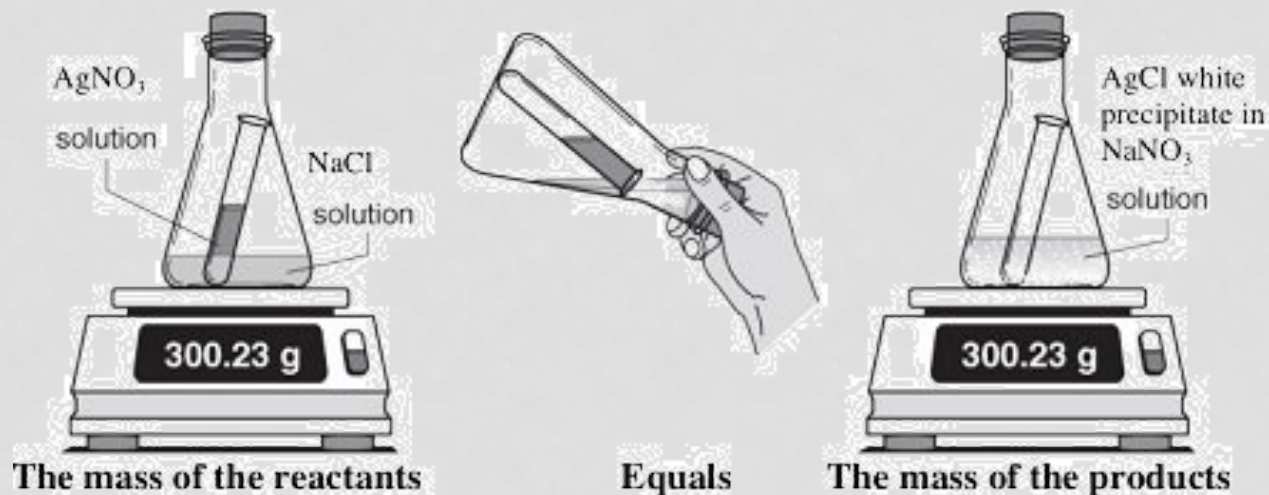
→



table salt

# CHEMICAL EQUATIONS

- Mass of reactants = mass of products
- Law of conservation of mass: Mass can't be created or destroyed
- No new atoms are made or destroyed in a chemical reaction
- Amount of each atoms present should be the same in the reactant and product side.

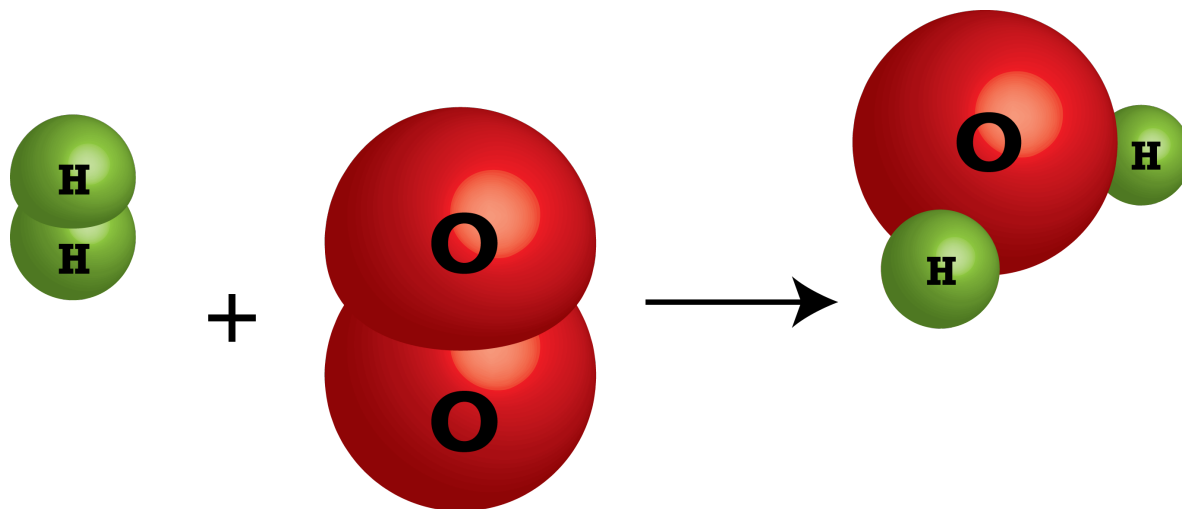


# BALANCING CHEMICAL EQUATIONS

- Example 1:
- Water is made from Hydrogen gas ( $\text{H}_2$ ) and oxygen ( $\text{O}_2$ ).
- Lets write a chemical equation for that.

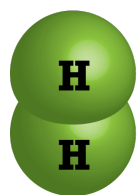
# BALANCING CHEMICAL EQUATIONS

- Example 1:
- Water is made from Hydrogen gas ( $\text{H}_2$ ) and oxygen ( $\text{O}_2$ ).
- Lets write a chemical equation for that.

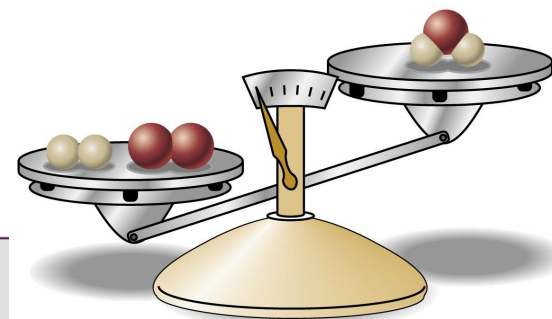
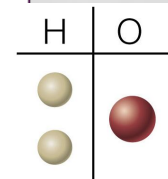
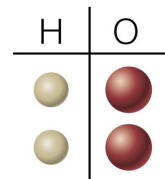
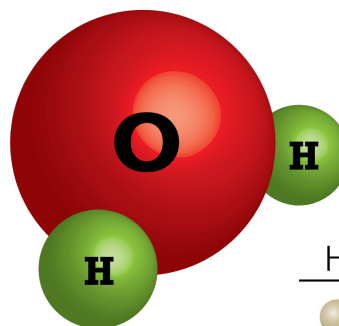
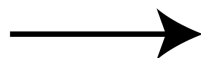
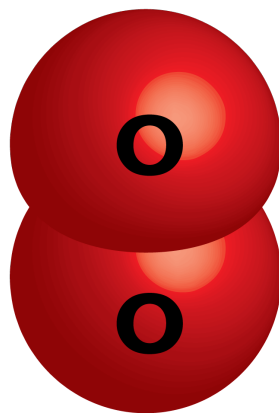


# BALANCING CHEMICAL EQUATIONS

- Wait???? There is more oxygen in the reactant side
- Do you think you only have one molecule of hydrogen gas?



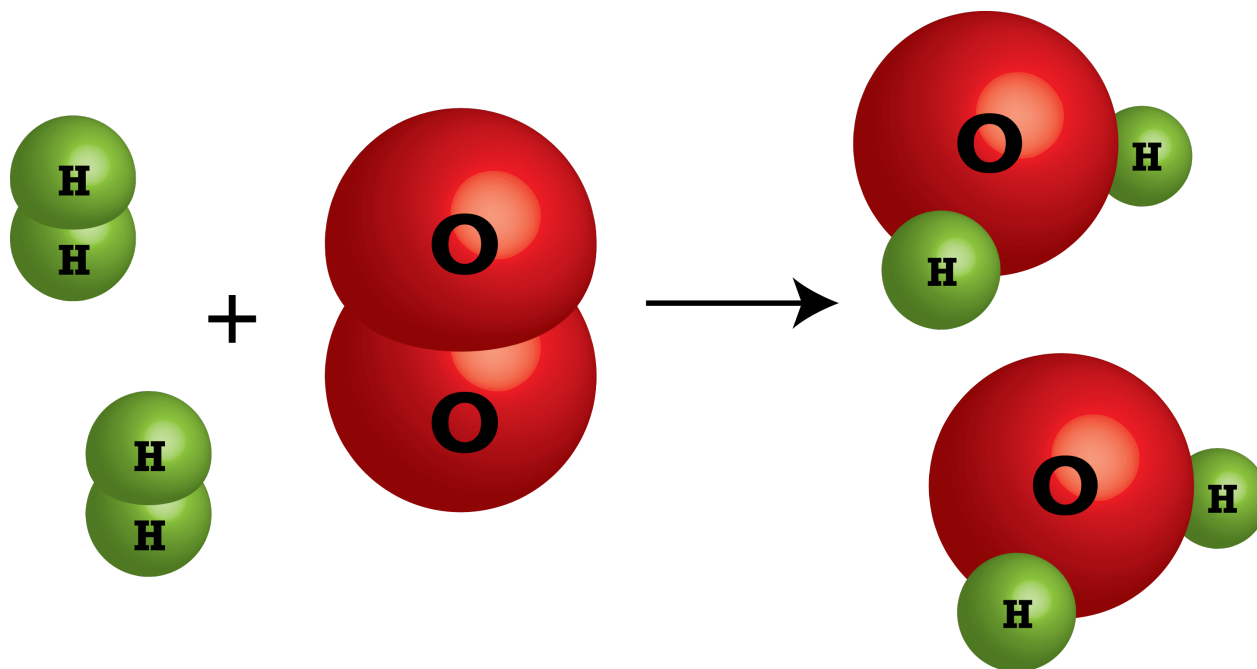
+





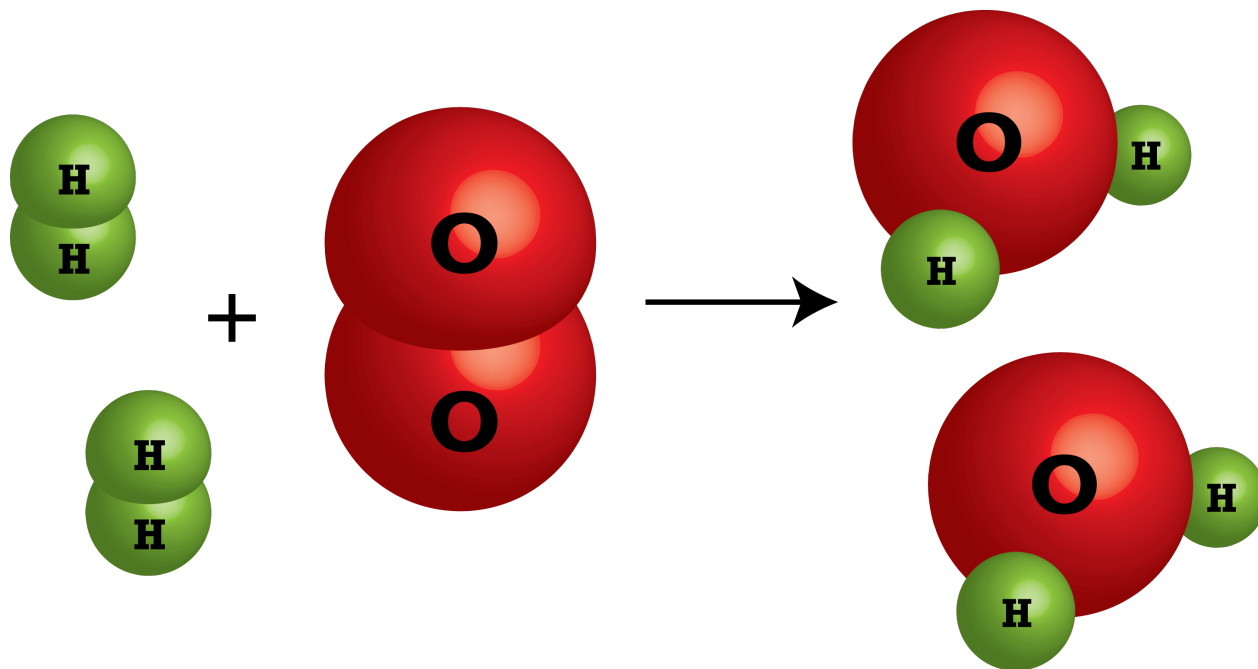
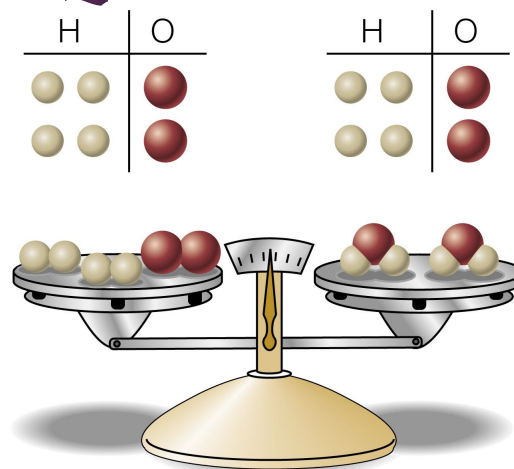
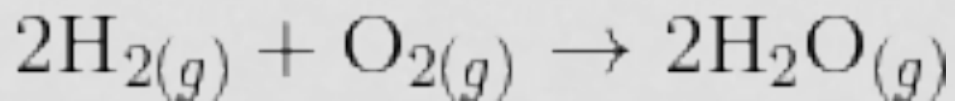
# BALANCING CHEMICAL EQUATIONS

- Wait???? There is more oxygen in the reactant side
- Do you think you only have one molecule of hydrogen gas?



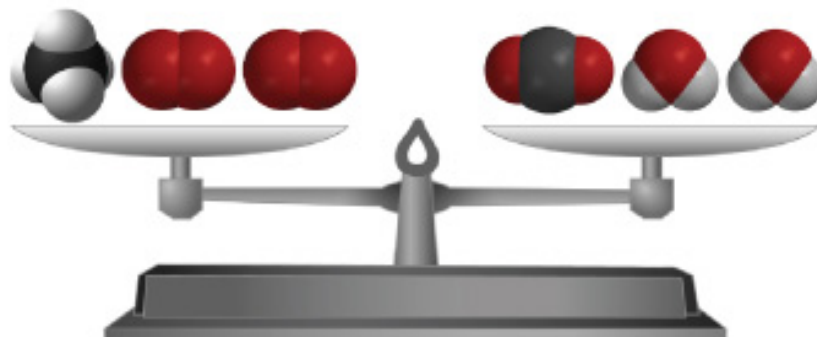
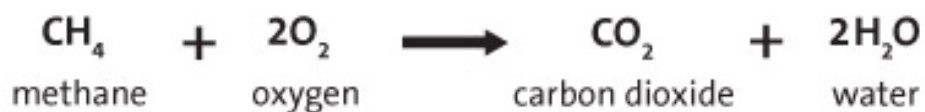
# BALANCING CHEMICAL EQUATIONS

- Now they are balanced!!!



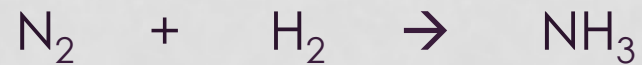
# BALANCING CHEMICAL EQUATIONS

- Example 2:



# BALANCING CHEMICAL EQUATIONS

- Example 3:



# BALANCING CHEMICAL EQUATIONS

- Example 3:

